

CLAIMS

1. A method for delivering an organometallic compound to a plurality of reactor sites, the method comprising the step of introducing a carrier gas into a container of the organometallic compound, picking up the compound in the gas to form a gaseous mixture, transporting the gaseous mixture to a reservoir and selectively distributing the gaseous mixture to one or more of a plurality of reactor sites, the method excluding the step of condensing the gaseous mixture.
2. A method as claimed in claim 1, wherein the rate of flow of the carrier gas and the carrier gas/organometallic mixture is controllable.
3. A method as claimed in claim 1 or claim 2 further comprising introducing a second source of carrier gas into the gaseous mixture after pick up of the organometallic compound.
4. A method as claimed in claim 3, wherein the addition of the second source of carrier gas is monitored to maintain the vapour concentration below saturation.
5. A method as claimed in any one of claims 1 to 4 further comprising the step of heating the gaseous mixture.
6. A method as claimed in any one of claims 1 to 5 wherein the gaseous mixture is drawn under vacuum or by means of pressure differential from the reservoir to each of the reactor sites.
7. A method as claimed in any one of the preceding claims wherein the pick up of organometallic compound in the carrier gas is kept constant.
8. A method as claimed in claim 7 wherein a constant pick up is achieved over flow rates ranging from 0 to 10 litres per minute.

9. A method as claimed in any one of the preceding claims wherein the carrier gas is hydrogen.
10. An apparatus for delivering an organometallic compound to a plurality of reactor sites, the apparatus comprising an inlet for introducing a carrier gas (2) into a container (1) of the organometallic compound, a reservoir for storage of the gaseous mixture of the compound and the carrier gas and an outlet for selectively distributing the gaseous mixture to one or more of a plurality of reactor sites (12, 14, 16, 18, 20), the apparatus excluding a condensor for condensation of the gaseous mixture.
11. An apparatus as claimed in claim 10, wherein one or more mass flow controllers (4) are provided to control the rate of flow of the carrier gas and the carrier gaseous mixture through the apparatus.
12. An apparatus as claimed in claim 11 wherein a first mass controller (4) is positioned to control the rate of flow of carrier gas into the container (1).
13. An apparatus as claimed in claim 10, 11 or 12, further comprising means for introduction of a second source of carrier gas into the gaseous mixture after pick up of the organometallic compound.
14. An apparatus as claimed in claim 13, wherein a second mass flow controller (7) is provided to monitor the addition of the second source of carrier gas.
15. An apparatus as claimed in claim 14, wherein the second mass flow controller (7) is linked to the first mass flow controller (4).
16. An apparatus as claimed in any one of claims 10 to 15 wherein the reservoir (9) is provided with a pressure controller (8).

17. An apparatus as claimed in any one of claims 10 to 16 wherein means is provided to allow the gaseous mixture to be drawn under vacuum or by means of a pressure differential from the reservoir (9) to each of the reactor sites (12, 14, 16, 18, 20).
18. An apparatus as claimed in any one of claims 10 to 17 wherein each reactor site (12, 14, 16, 18, 20) is provided with its own mass flow controller (12a, 14a, 16a, 18a, 20a) to determine the rate of entry of the gaseous mixture into the reactor.
19. An apparatus as claimed in claim any one of the preceding claims wherein the container (1) of organometallic compound is a bubbler, the carrier gas being introduced into the bubbler by means of a dip pipe (3).
20. An apparatus as claimed in claim 19 wherein the bubbler is surrounded by a temperature controlled oil bath (5).
21. An apparatus as claimed in claim 19 or claim 20 wherein the bubbler is provided with means (6) for monitoring the level of organometallic compound therein.
22. A bubbler (100) comprising a container for precursor and a dip pipe (102) for passage of a carrier gas therethrough to pick up the precursor in the gas, wherein the bubbler includes one or more of the following features:
  - (a) a narrowing of the container at or near the base thereof to aid complete utilisation of the precursor therein; and
  - (b) one or more hollow members (104a, 104b, 104c) extending substantially perpendicularly to the dip pipe (102) and being in fluid communication therewith, each member having an opening (106) therein to aid pick up of the precursor.
23. A bubbler as claimed in claim 22, wherein the base of the bubbler is provided with a narrowing.

24. A bubbler as claimed in claim 23, wherein the base of the bubbler has a smaller vessel placed therein relative to the bubbler.
25. A bubbler as claimed in claim 23 or claim 24 wherein the end of the dip pipe is positioned within the narrowing or smaller vessel.
26. A bubbler as claimed in any one claims 22 to 25 wherein the dip pipe (102) is provided with one or more hollow members (104a, 104b, 104c) extending substantially perpendicularly therefrom.
27. A bubbler as claimed in claim 26, wherein each hollow member (104a, 104b, 104c) is situated at the base of the dip pipe.
28. A bubbler as claimed in claim 26 or claim 27, wherein each member is provided with a plurality of holes (106) in one or more sides thereof.
29. A bubbler as claimed in claims 26, 27 or 28 wherein the dip pipe is provided with a hollow cross at the base thereof.
30. A bubbler as claimed in claim 29 wherein each leg of the cross has a plurality of holes.
31. A bubbler as claimed in claim 30 wherein the holes are provided in the same side of each leg.